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THE ASSOCIATES, through whose interest and generosity *The Bulletin* and certain other undertakings of the Arboretum are made possible, is an informal group of individuals interested in encouraging and furthering the educational and research endeavors of the Morris Arboretum.

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Contributing	\$ 5.00 a year	Supporting	\$ 25.00 a year
Sustaining	\$10.00 a year	Sponsoring	\$100.00 a year
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Arboretum Activities

THE STAFF

The Director has been invited by Dr. Alan T. Waterman, Director of the National Science Foundation, to serve on the newly formed Science Information Council. The primary function of this Council will be to study the means whereby the rapidly increasing volume of scientific literature throughout the world may be made more readily available to scientists.

Dr. H. L. Li, Taxonomist, departed on March 19th for a two and a half month's stay in the Far East in connection with his studies on the trees and shrubs of Formosa. He will visit the important botanical collections in Hong Kong and Formosa and will spend most of his time working in the large herbarium centers in Tokyo and Kyoto.

(Continued on Page 14)

The Influence of Oriental Plants on Early Pennsylvania Gardens¹

HUI-LIN LI

Botanical and horticultural contacts between North America and the Far East in colonial times were not direct but took place through Europe. The early American colonists, like all other emigrating people, were at first, for sentimental reasons and by personal preference, more interested in the plants of their original home than in the native plants of their new land. Seeds of vegetables and trees brought over from the Old World were planted out by the pioneer settlers within days after their arrival and as soon as land could be cleared.

INTRODUCTION OF ORIENTAL PLANTS TO EUROPE

Among these early introductions from Europe were plants of eastern Asiatic origin, for a number of plants from China were already in cultivation in Europe by the 17th century. A few plants, like the Peach, Day Lily, White Mulberry, Shrubby Althea, Persian Lilac, and Weeping Willow were carried from China to central and western Asia in fairly early times across the deserts of central Asia by the celebrated Silk Route. Then in the 16th century, the Portuguese brought Sweet Orange from China through early sea trade. The sea trade of the Dutch with eastern Asia in the 17th century brought first to Europe such ornamental plants as the well known Japanese or Indian Azaleas (*Rhododendron indicum*) and the Garden Chrysanthemums (*Chrysanthemum sinense*). The Dutch were especially successful in their commercial enterprise in Japan whence they also introduced into Europe such economic plants as the Camphor tree and the Tea plant. (Fig. 1)²

In the eighteenth century the contacts made by Europeans with China and Japan were much more numerous. In addition to the Portuguese and Dutch, Englishmen, French, Swedes and many others participated. Besides traders, Catholic missionaries were notably active. Many learned Jesuit fathers were interested in the plants and plant products of the East. During this century we note the work of such famous botanical explorers as James Cunningham of England, who collected in China in 1701, Peter Osbeck of

Sweden, who collected in China in 1751, and Karl Peter Thunberg, also of Sweden, who collected in Japan, 1775-76. Magnus von Lagerstroem (1696-1759), a Swedish naturalist who had never been in Asia, was instrumental in introducing the Chinese Crape Myrtle (*Lagerstroemia indica*) into Europe. The species was named by Linnaeus in honor of his friend.

Among the Jesuit missionaries of this period, the most celebrated name is D'Incarville, a Frenchman, who spent nearly 17 years (1740-1757) in China and who first introduced from China to Europe, among other things, Tree of Heaven (*Ailanthus altissima*), Chinese Scholar Tree (*Sophora japonica*) (Fig. 2), Oriental Arborvitae (*Thuja orientalis*), Goldenrain-Tree (*Koelreuteria paniculata*), Jujube (*Zizyphus Jujuba*), as well as the Chinese Cabbage and Mustard. Joannis de Loureiro, a Portuguese missionary to China and Indo-China, 1735-1782, also collected and studied the floras of these countries. Thus in the 18th century, a large number of Chinese and Japanese plants were already established in European gardens, and these were introduced, along with plants of European origin, into the newly established colonies in America. Around the middle of the eighteenth century, besides those we have mentioned, some other Oriental plants then available were Holly-



Fig. 1. The Camphor Tree was an early introduction from China. This one grows in Alabama. (U. S. Forest Service photo).

¹Based on a talk given at the Symposium on Pennsylvania Gardens, Strawberry Mansion, Philadelphia, on October 9, 1958.

²Cover illustration and figs. 1, 3, 4 and 9, courtesy of Mr. William R. Carpenter.



Fig. 2. The Chinese Scholar Tree was introduced into the Western garden by D'Incarville in the middle 18th century.

hock (*Althaea rosea*), Bleeding Heart (*Dicentra spectabilis*), Chinese Pink (*Dianthus chinensis*), St. John's Wort (*Hypericum patulum*), Camellia (*Camellia japonica*), Rose-of-China or Chinese Hibiscus (*Hibiscus Rosa-sinensis*), Rose-of-Sharon or Shubby Althea (*Hibiscus syriacus*), Touch-me-not (*Impatiens balsamina*), Chinese Honey Locust (*Gleditsia sinensis*), China Rose (*Rosa chinensis*), Bank's Rose (*Rosa Banksiae*), Cherokee Rose (*Rosa laevigata*), Chinese Matrimony Vine (*Lycium chinense*), Cockscomb (*Celosia argentea*), Wikstroemia (*Wikstroemia indica*), and Chinese Juniper (*Juniperus chinensis*).

Eastern Asiatic plants cultivated in European gardens toward the end of the 18th century were even more numerous, including various garden species of Magnolia, Rose, Lilac, Privet, Peony, Honeysuckle, Cherry, Hydrangea, and many others. Especially to be mentioned is Ginkgo or the Maidenhair Tree, the oldest of living tree species, which was introduced into Europe toward the middle of the 18th century, and a most sought after tree for every botanical garden.

EARLY TRENDS OF AMERICAN GARDENING

We can thus see that a large number of plants of Asiatic origin were available to the early gardeners in the New World. In the 17th and 18th centuries, Chrysanthemum, Hollyhock, Cockscomb, Peony and Day Lily decorated the front yard garden and flower borders of old New England towns. Camellia, Crape Myrtle, Honeysuckle, Bank's Rose and Azalea were popular plants in the gardens of Virginia and other southern states. But perhaps even more profound were effects wrought by eastern Asiatic plants upon the horticulture and gardening of the Middle Atlantic States, especially in the Philadelphia area.

Here, as we all know, was located the first permanent botanical garden. Here was the place that set up the trend of American landscaping for years to come. As I see it, most of the early gardens of Pennsylvania were not gardens of flowers, but gardens of trees and shrubs. The botanical gardens of America are mostly arboreta and not the usual type of botanical gardens of the Old World where hot houses and flower beds are the dominant features. For landscaping in American gardens the popularity of informal gardens over geometric types was very early noted.

The molding of these trends was undoubtedly due in part to the exceedingly rich sylvan wealth available to the early settlers. True it is that in Europe the formal type of garden with geometrical design was already declining in popularity and the natural or landscape style was gaining. (This trend, developed first in England, was, as generally noted, mainly due to the influence of Chinese gardens.) But the presence of the nu-



Fig. 3. This Ginkgo tree in Bartram's Garden is supposed to be the first in American. Photo taken in 1956 by W. R. Carpenter.



Fig. 4. This Ginkgo tree in Tyler Arboretum was planted in 1849. Photo by W. R. Carpenter.

merous kinds of trees and shrubs, and the beautiful natural scenery provided by these plants, may have exerted an appreciable influence in the major trends of gardening in this new land. The available kinds of exotic trees and shrubs from Asia, notable either for their unusual interest or beauty, no doubt enhanced the movement of arboretum building and naturalistic gardening. The remarkable success of eastern Asiatic plants in eastern North America, greater than in Europe, was due to the geographical and geological relationships of the two distant floras, a fact which was made known at a later date and which has since affected American gardening even more profoundly than before.

Turning more specifically to early Pennsylvania gardens, though few records of lists of plants in these early ones are extant, we still have some general knowledge about the gardens of colonial Pennsylvania. We know that the early Germantown settlers, at the beginning of the 18th century, had a passion for flowers, and in their family gardens were found such Oriental plants as Hollyhock and Chrysanthemum. Later there were larger gardens of beauty, and plants like Snowball, Pinks and Lilies were among the favorite flowers used. Soon every house was shaded with trees, with the Asiatic Weeping Willow as popular as the European Lombardy Poplar. Fruit trees were of course planted early, and among these were the Peach and Apricot of Chinese origin. People were in general interested in the cultivation and the introduction of rare trees.

BARTRAM'S GARDEN AND THE WOODLANDS

Thus in Bartram's Garden (started in 1728) although it was primarily for native species, the Ginkgo figured most prominently. The unique Ginkgo tree from China was the favorite importation of many early American gardens. The

Bartram tree is supposed to be the first one introduced into America. Another early introduction, believed by some to be even earlier than Bartram's, is in the nearby Woodlands, a garden started by Andrew Hamilton in 1735. This tree, still extant, has been called one of the arboreal treasures of Philadelphia and is visited by tree lovers from all parts of the world.

For a while The Woodlands was cared for by the famous botanist, Frederick Pursh. Toward the latter part of the 18th century The Woodlands, which then belonged to William Hamilton, became the finest garden of exotic plants in America. Asiatic plants then in cultivation, beside Ginkgo, included Crab, Zelkova, St. John's Wort, Honeysuckle, Peonies, Hollyhock, Lilies, Oleander, and Crape Myrtle. It had the first Ailanthus or Tree of Heaven planted in America (in 1784). There were extensive greenhouses and orangeries. The influence of The Woodlands on American horticulture and landscaping is immense. It brought in very many interesting exotics and set the trend for foreign plant introduction and for the establishment of arboretums. It also greatly influenced Thomas Jefferson, the father of American landscaping, who obtained from The Woodlands many plants for Monticello.

GINKGO AND AILANTHUS

Ginkgo, as mentioned before, was one of the most favorite trees of early American gardens. Many fine old specimens can still be seen around the Philadelphia area. The first one on record to bear fruit was that one in John Wister's garden in Germantown, where the Mansion was built in 1744. This tree was supposed to have been received from Japan as a seedling, a gift from the Japanese Emperor to John Wister and is believed by some to be the earliest introduction to this country. A study of the history of old



Fig. 5. The Japanese Snowball was first introduced into American gardens in the early 19th century.

Ginkgo trees in Philadelphia is a fascinating subject, as there are many claims as to which was planted first. Another important center of plant introduction was the Botanic Garden of Humphrey Marshall, started in 1773, where many exotics were planted along with native plants. (Figs. 3 & 4).

A major event in American horticulture took place in 1784 when David Landreth, an Englishman, established a seed house in Philadelphia, the first important concern of its kind. It developed into the largest seed house in the latter part of the century and for some time specialized in roses, camellias, rhododendrons, azaleas and magnolias, — plants mostly of Asiatic origin. In the greenhouses great numbers of oranges, lemons and shaddockes were grown.

Lest one think that the influence of Oriental plants on early American gardens is here being exaggerated, he may be more convinced by the mere mention of *Ailanthus* and Japanese Honeysuckle, two plants which have since altered completely the scenery of many American cities and their countryside. The Japanese Honeysuckle was introduced toward the beginning of the

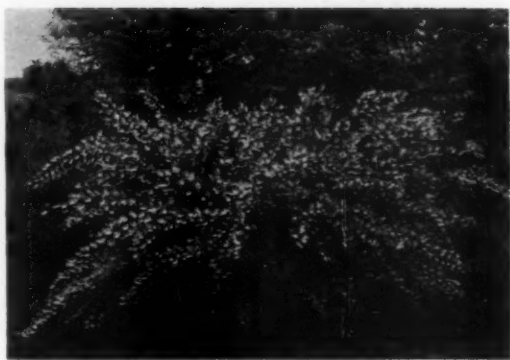


Fig. 7. The Asiatic *Deutzia* is a very floriferous shrub introduced into America in the early 19th century.

nineteenth century but *Ailanthus* came earlier, as mentioned before, first in 1784 to The Woodlands. People now generally consider *Ailanthus* an undesirable tree, but for some time after its first introduction from China, in the 18th and early 19th centuries, it was one of the most planted and highly valued trees in Europe as well as in America. It was planted especially along the streets and was considered very ornamental with its large feathery compound leaves producing a tropical effect. In America, for instance, the several large *Ailanthus*, among the earliest introduced, were long regarded as outstanding trees in Humphrey Marshall's garden. In the early 19th century, forty-three kinds of native trees from all parts of the union grew in Independence Square together with seven foreign ones. These were all specially selected and considered as first class trees. These foreign trees were mostly of European origin, but there was also a "majestic" *Ailanthus*. The reverse of fortune came toward the late 19th century. *Ailanthus* began to fall into disfavor when it was accused of being overly aggressive for its root suckering and as offensive for the odoriferous pollen of the male trees when in flower.

INTRODUCTIONS IN THE 19TH CENTURY

The trend of introducing exotic plants continued into the 19th century. In the Germantown area, Crape Myrtle and *Chimonanthus* or Wintersweet, were then in cultivation at the Wyck or Witt Garden. In the Evans' Arboretum at Bryn Mawr (started around 1828), many exotics were found including the Asiatic Yulan Magnolia and *Cryptomeria*. Although no list of plants was in existence, it was known that through exchange with Sir W. J. Hooker at Kew Gardens of England Evans obtained many rare plants from various parts of the world and through his son J. D. Hooker who explored the Himalayan Mountains, many Himalayan plants.



Fig. 6. The Chinese *Wisteria* became extremely popular in America soon after its introduction at the beginning of the 19th century.

especially Rhododendrons, were introduced and planted there. Then the Painter's Arboretum, now Tyler Arboretum, through Evans, Meehan and many others, obtained various plants from abroad. Of the exotics there, Ginkgo, Cryptomeria and Magnolias were among the most notable. The Chinese and Japanese Snowballs, Wisterias and Deutzias, introduced in the early 19th century, soon became extremely popular in American gardens. (Figs. 5, 6 and 7).

The extent of the use of Asiatic plants in American gardens toward the mid-19th century can be seen in Thomas Meehan's "The American Handbook of Ornamental Trees," 1853, describing primarily all the trees then growing in Bartram's Garden. The trees of eastern Asiatic origin are listed below (the names being here rendered in modern nomenclature):

<i>Ailanthus altissima</i>	Tree of Heaven
<i>Albizia julibrissin</i> *	Mimosa Tree ²
<i>Broussonetia papyrifera</i>	Paper Mulberry
<i>Cryptomeria japonica</i>	Cryptomeria (Fig. 8)
<i>Ginkgo biloba</i>	Maidenhair Tree
<i>Hibiscus syriacus</i>	Shrubby Althea
<i>Koelreuteria paniculata</i>	Goldenrain Tree
<i>Lagerstroemia indica</i>	Crape Myrtle
<i>Magnolia Soulangeana</i>	Saucer Magnolia (Hybrid Chinese Magnolia orig. 1820 in France)
<i>Malus spectabilis</i>	Chinese Crabapple
<i>Morus alba</i>	White Mulberry
<i>Prunus persica</i>	Peach
<i>Salix babylonica</i>	Weeping Willow
<i>Sophora japonica</i>	Chinese Scholar Tree
<i>Thuja orientalis</i>	Oriental Arbor-Vitae
<i>Thuja orientalis flagelliformis</i>	Oriental Arbor-Vitae, a weeping form

The Meehan's Nursery in Germantown played an important role in the introduction of exotic plants into the American gardens in the nineteenth century.

ASIATIC ECONOMIC PLANTS

Besides ornamental trees and flowers, Philadelphia was first in the introduction of many Asiatic economic plants into this country. Here in Fairmount Park, Lemon Hill is so named because of its first introduction of Lemon trees into American gardens. There in the hot houses were also grown Oranges, Shaddock, Tea plant, and other economic plants from China and other parts of Asia.

²See cover illustration. This Albizzia tree along 7th street in Oak Lane is claimed to be the largest on record in this country.

Although the practice is now largely a thing of the past, oranges and lemons were so popular during the early 18th century, that special houses called orangeries were built to shelter them in the winter. The trees, kept dwarf by severe pruning, were planted in wooden tubs, which could be carried out in the summer to decorate the garden. At Lemon Hill there was an orange garden, bordered with box, set in turfed squares with walks. The owners of orangeries at that time were content if they ripened a few miserable oranges or lemons in a year. It is recorded that Philadelphia was astonished when the gardener at Lemon Hill picked two wash tubs of lemons to make that atrocious drink called lemonade for a party. With the coming of the first railroads, citrus fruits were imported from the south and the orangeries passed out of existence. (Fig. 9).

Other Chinese plants were introduced into America for economic purposes. Franklin, who sent soy bean seed to Bartram, was probably the first to introduce this most important Chinese plant to America. The Chinese White Mulberry was introduced into Long Island for raising silk



Fig. 8. Cryptomeria is an ornamental conifer introduced from eastern Asia in the early 19th century. This is the var. 'Lobbii'.

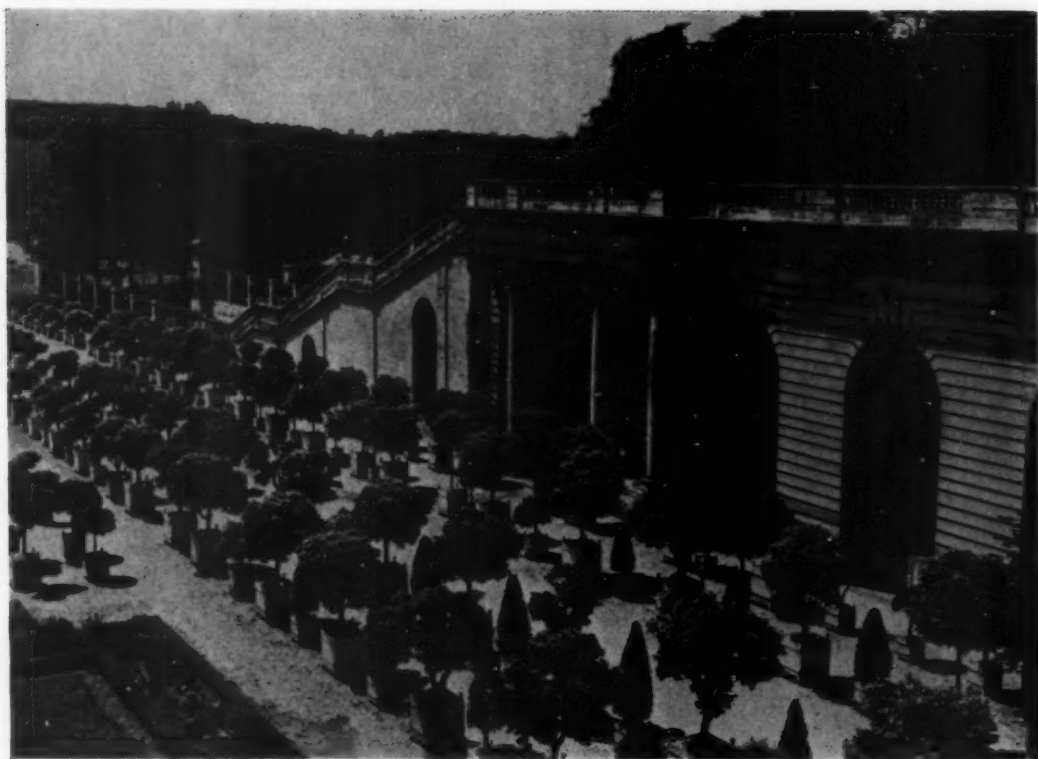


Fig. 9. Orangeries were popular in Philadelphia in the 18th century, after the European fashion. This one, of the Palace of Versailles, France, still extant, was built in the 17th century.

worms and vast plantations were in existence in the late 18th century. In 1830 interest and practice were so universal that cuttings were used as currency at 12½ cents. The mulberry speculation, started in 1825, lasted until 1844 when the cold winter and disease destroyed the last plantations. Old trees, however, scattered over various parts of the country, still exist as relics of this mulberry mania. The Chinese Paper Mulberry (*Broussonetia papyrifera*) was for some time also much esteemed as an ornamental tree. Its erstwhile popularity soon faded and like the Ailanthus its fate reminds us the changing fortunes of plants. Tender plants were also imported early for ornamental purposes such as Indian Azaleas, Oleander, Camellia and Chinese Hibiscus, which were cultivated in pots and used outdoors like Geraniums. Toward the middle of the 19th century, Camellia was the flower of flowers, in France and England, as well as in America, and is used extensively as corsage and bouquet even to this day. Before Horticultural Hall was demolished, visitors could see a specimen of Sago Palm, *Cycas revoluta*, from southern China, ori-

ginally owned by Robert Morris before and during the Revolutionary War.

RELATIONS OF THE ASIATIC AND AMERICAN FLORAS

Since we are considering the influence of Oriental plants on early American gardens, we may well end our discussion at the middle of the last century. But mention must be made of two facts made known at about this time that had great effects on American horticulture and gardening. One was Asa Gray's studies on the relationships between the floras of eastern North America and eastern Asia, particularly China and Japan. Many genera of plants, such as *Magnolia*, *Liriodendron*, *Wisteria* and *Pachysandra*, to mention but a few, are found only in these two distant regions and nowhere else in the world. Various geological and paleogeographic factors, especially the effects of the last glaciation, brought about this unique relationship.

Because of the basic relationship and similarity in climate and other physical conditions, most plants of eastern Asia thrive in eastern

North America when introduced into the gardens. The success of these eastern Asiatic plants in North America can be most vividly demonstrated by *Ailanthus* and Japanese Honeysuckle. Many other plants from eastern Asia frequently escape from cultivation and seed freely, becoming part of the naturalized flora, such as Paulownia, (Fig. 10), White Mulberry, Paper Mulberry and Hibiscus.

EXPLORATIONS IN CHINA

At about the same time, in the mid 19th century, another important event occurred in horticulture. China and Japan were opened up to the western countries. The epic journey made by Robert Fortune in 1848 revealed to the world for the first time the extraordinary horticultural wealth of China. This was followed by many other famous botanical explorers, such as Augustine Henry, Père A. David, Père Delavay and many others, whose efforts added greatly to our knowledge of the rich flora of eastern Asia and at the same time enriched abundantly the gardens of the world.

These two events occurring toward the middle of the 19th century opened up a new and vigorous chapter in the history of gardening of the world. And America was beginning to play an increasingly more important role in horticulture and gradually took over the lead from Europe. From the end of the 19th century onward, many botanical explorers such as E. H. Wilson, Frank Meyer and J. F. Rock, to name but a few of the best known, have brought back from the mountainous regions of China and Japan numerous beautiful plants hitherto unknown to the gardens. And so, up to today, many more Asiatic plants are planted in the gardens of Europe and



Fig. 10. The majestic Paulownia, introduced in the early 19th century, is now naturalized in the eastern United States.

America than native plants from these regions combined. The early Pennsylvania gardens have played a not insignificant role in all these achievements.

New Associates

The Arboretum is happy to welcome the following new Associates who have been enrolled since December, 1958:

Bloodgood Nurseries Inc.
Mrs. Henry W. Bousman
Miss Hebe Bulley
Mr. and Mrs. Robert E. Coughlin
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Bisexual Conelets in Spruce

FRANK S. SANTAMOUR, JR.¹

Coniferous tree species, including the spruces, are usually monoecious in flowering habit; that is, both purely male and purely female conelets² are borne on the same tree. Occasionally, however, abnormal structures occur in which both male and female organs are found in the same conelet.

Although such bisexual conelets have been reported in most genera of the Pinaceae, most of the reports deal with the finding of only one or a few bisexuals on a tree. The discovery of numerous bisexual conelets on *Picea montigena* Masters, in the spring of 1958, prompted a survey of all the spruce species growing in the Philadelphia area that are used in forest genetics research by the Northeastern Forest Experiment Station. Specimens of 25 species were examined and, of the 17 species that fruited in 1958, a total of 11 trees representing 7 spruce species was found to bear bisexual conelets (Table 1).

TABLE 1. — THE PRODUCTION OF BISEXUAL CONELETS AND POLLEN ABORTION IN SEVERAL SPRUCE (PICEA) SPECIES

Species	Trees	Bisexual conelets/tree	Pollen abortion	
			Normal conelets Percent	Bisexual conelets Percent
<i>asperata</i>	2	c.50,500+	1	10
<i>Balfouriana</i>	1	25	—	—
<i>glauca</i>	3	c.10	1	—
<i>montigena</i>	2	500+	2	40
<i>retroflexa</i>	1	13	6	16
<i>Smithiana</i>	1	24	4	35
<i>Wilsonii</i>	1	33	—	52

CHARACTERISTICS OF CONELETS

The bisexual conelets of all species examined except *P. Smithiana* Boiss. (Himalayan spruce) were essentially of the same type. Male tissues occurred on the lower portion of the conelet and the female tissue occupied the tip in varying proportions (Fig. 11). Although some variation was encountered on each tree sampled, the aver-

age proportion of female tissue to the length of the conelet was 1/5 for *P. montigena*, *P. Wilsonii* Masters, and *P. asperata* Masters; 1/4 for *P. Balfouriana* Rehd. and Wilson; and 1/2 for *P. glauca* (Moench) Voss (white spruce). Even though some bisexuals were erect, as the normal female is, all appeared to be basically male.

In the *P. Smithiana* conelets examined, female tissue always occurred at the base and was usually present at the tip. Some of the conelets were predominantly female (Fig. 12, B, C) while others were essentially male (D, E). The transition zone between male and female tissue was irregular in *P. Smithiana* but abrupt in the other species.

Some degree of separation of the sexes is common in the crowns of spruce; female conelets are usually concentrated in the upper portion and male conelets in the lower portion. The bisexual conelets were found in all but the top-most section of the trees. Some other interesting observations: *P. retroflexa* bore no purely female conelets; and on *P. Wilsonii*, which likewise had no pure females, almost the entire crop was bisexual.

POLLEN ABORTION

Just before anthesis a number of normal male and of bisexual conelets of the various species were collected and allowed to shed pollen in the laboratory. Pollen slides were made with glycerine jelly and the degree of pollen abortion



Fig. 11. A female conelet of *Picea montigena* (left), compared with two bisexual conelets.

¹The author is a geneticist of the Northeastern Forest Experiment Station, U. S. Forest Service. He is stationed at the Morris Arboretum of the University of Pennsylvania, where the Experiment Station and the Arboretum cooperate in genetics research.

²The reproductive structures of conifers are known variously as flowers, cones, conelets, catkins, and strobili. The term conelets is used in this paper.

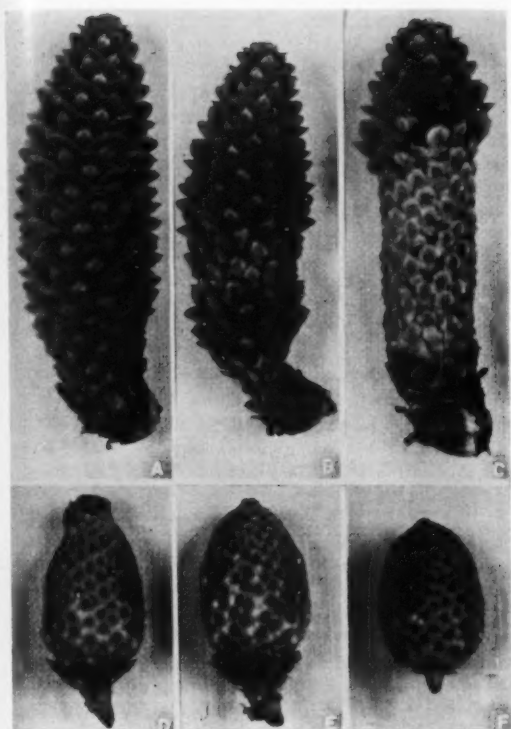


Fig. 12. Normal and bisexual conelets of *Picea Smithiana*. A is a female conelet; B, C, D, and E are bisexual; and F is a male conelet.

was determined from 200 single pollen grains selected at random. The results (Table 1) show that pollen abortion was considerably higher in the bisexual conelets.

An additional abnormality of the "bisexual" pollen was noted in *P. asperata* and *P. Wilsonii*, 6 and 63 percent respectively of whose pollen was shed in the form of tetrads. The degree of abortion of these tetrads was essentially the same as that of the single grains and no instance of normal and aborted pollen occurring in the same tetrad was found. The individual pollen grains of the good tetrads were normal in most respects, with well-developed wings, and the nuclei were stainable with aceto-carmin.

Pollen samples taken from the base, middle, and tip sections of bisexual conelets of *P. montigena* and *P. asperata* showed no consistent differences in degree of pollen abortion. Thus the physiological disturbances resulting in pollen

abortion do not appear to be affected by position in relation to the female tissue.

CONE MATURATION

Mature cones developed from bisexual conelets only on *P. Smithiana*. The three mature cones found were all derived from the same conelet type: that with only a small collar of male tissue near the middle of the conelet (Fig. 12, B). Survival and maturation of these aberrant conelets apparently depends to a large extent on the amount of female tissue present. In all species the length of time the conelets appeared to be functional, as judged from color and freshness, varied according to this factor.

Seed extracted from the three bisexual cones was of normal size, but no filled seed was found. Likewise, none of the seed extracted from normal cones was filled. This is not surprising, since no other trees of the same species occur nearby. It may be inferred, however, that the disturbed physiology of the bisexual conelets does not render them any more susceptible than normal conelets to natural self-fertilization or to hybridization with *P. glauca* and other species that were shedding pollen during the receptive period of *P. Smithiana*.

DISCUSSION

Since no bisexual conelets had been noted on the trees studied during 10 years of observation prior to 1958, it seems unlikely that such conelets are a normal or common occurrence. No definite conclusions can be offered as to the cause of this apparent outbreak of bisexuality.

Of the 7 species that bore bisexual conelets, 5 are native to China, 1 to the Himalayas, and 1 to North America. They represent 2 of the 3 sections of the genus *Picea*, and the individual specimens range in age from 25 to 35 years. With the exception of *P. glauca*, these species are rarely planted and are relatively unknown outside of arboretums.

Although it might be speculated that bisexuality is fairly common among the above exotics and simply has not been observed, the show of bisexuality in the American *P. glauca* in 1958, along with the exotics, casts doubt on such speculation. It seems more probable that the cause of the conelet abnormalities is largely environmental in character. The severe drought of 1957 may have been a major contributing factor.

Book Reviews

A FIELD GUIDE TO TREES AND SHRUBS, by George A. Petrides. Illustrated by the author and Roger Tory Peterson. Houghton Mifflin Company, Boston, 1958. \$3.95.

Since the text in the Peterson Guide series devoted to Ferns was the most crudely written, inaccurate, and misleading ever published on these plants, it is a pleasure to report that the one on trees and shrubs is about the best ever devoted to them.

The area covered, northeastern and midland states and adjacent Canada, is the same as that of the 8th edition of Gray's Manual, and the technical nomenclature conforms to this work. The sequence of taxa is, however, wisely based on practical considerations of emphasizing resemblances rather than relationships. Another divergence, on the whole cleverly planned and applied, is the use of colloquial instead of technical terms, e.g., "feather-compound" instead of the customary pinnate-compound.

The descriptions and the illustrated keys, with leaves printed in green, are excellently worked out, and should make identification of unknowns simpler and at the same time more certain than any similar book thus far published. The drawings, on which many users will of course depend, are nearly all accurate and realistic. It may merely be noted that the acorn of Scrub Oak is shown a bit large, and that the early leaves of Sour Gum may bear a few coarse teeth. In the text, however, there are slips which may be worth pointing out to help the user of this edition and suggest possible improvement of a second.

Actual typographical errors are exceedingly few; the reviewer noted "bell" for ball-shaped fruits of the Fringe-tree, and the misspelling "Ponciris" once, "Symplocus" three times, and "tips" instead of tip with the illustration of Tulip-tree. The color of Red Cedar fruit and Sweetleaf flower, and the features of the fruit of American Strawberry-bush do not accord with Gray's Manual. On the other hand this Manual is usually followed so closely that slips in it sometimes got copied, e.g., that Sugar-maple leaves are normally hairless and that Small named the southern Sheep-laurel "caroliniana" (should read *carolina*). The author is manifestly not very familiar with the members of the Heath Family, and has misdescribed several of them. The flowers of Black Huckleberry are reddish, not "whitish," while those of Great Rhododendron

are never "reddish", but mostly white to pinkish; those of Fetterbush are more often pink than white. The flowers of Labrador Tea are not "bell-like" but open-faced as shown indeed in the drawing on p. 282; the same holds for the Pepper-bushes. In Staggersbush the flowers are rarely pink, and are large, not "small;" those of Zenobia are the largest of the group, and so on.

One diagnostic character, rarely used in other works, is unfortunately unrealistically treated. In the text, starting on page 53 and repeatedly on many later pages, end-buds are characterized as "false," with "true" under other species, by way of comparison. Then in the illustrated keys, beginning on page 181, the terms "absent" vs. "present" are used for the same situation. Actually both sets of terms are erroneous; what the author means is evidently "offset" vs. "centered."

For prospective users of this Guide in Pennsylvania it should be pointed out that the geographic ranges given are faithful renderings of those in Gray's Manual, but that some of these were compiled many years ago. At least ten taxa not stated or implied to grow in this state are now well-known here: Northern Mountain Ash, (p. 87), Pachistima (172), Canada Buffaloberry (182), Northern Arrowwood (190), American Barberry (228), Balm-of-Gilead (240), Mountain Alder (254), Box Huckleberry (278), Mountain Pepperbush (284), and Dwarf Azaleas (265).

EDGAR T. WHERRY

CAMELLIA CULTURE. Edited by E. C. Tourje. The Macmillan Company, New York, 1958, \$11.50.

On the jacket, it is stated that this book is "A compendium of the latest scientific practices, described from their own experience by 55 of the country's leading research workers and Camellia growers". The contents are divided into nine topics: plantings; care of camellias; climate; propagation and development; display, shipping and handling; pests and their control; diseases and methods of treatment; soils, nutrition, and moisture; breeding and hybridizing. The 44 papers includes such wide-ranging subjects as "Where, how, and when to plant camellias", "Disbudding camellias", and "Air layering" to others like "Embryo culture in camellia seed germination", "Leaf studies", and "The use of ionizing radiation in plant breeding".

This is a useful reference work for professional camellia growers and research workers. The various papers, written by 55 different authors, are necessarily of different merit and each has to be evaluated individually. The contributors vary from professors and research scientists to nurserymen and "Camellia fanciers". Thus some of the papers are carefully documented and provided with bibliographies while others are not. If all had been brought to a uniform scholastic stand-

ard, the book would have been a more useful volume than it is.

This is a valuable contribution to the cultivation of the camellia. The editor might well use the wealth of information contained therein to present to the amateur camellia grower a digested and organized treatise on this same general subject.

H. L. LI

Associates' Corner

In the last issue of the Bulletin we spoke of an outstanding local activity. As our Arboretum is international in its scope, a story of some of our East Indian contacts, which perhaps, we associates are not aware of, might be of interest.

When Dr. Fogg went to India in 1954 for two months, in search of drug plants for the Medicinal Garden at the Arboretum, among the many friends he made, were two young men in Southern India, who were exceedingly helpful to him. Dr. P. D. Varadarajan who was at that time engaged in botanical research at Madras University and Mr. P. V. Rajappan, who was employed as propagator at the Conoor Agricultural Experiment Station in the Nilghiris of Southern India.

Incidentally, India is exceptionally rich in drug species, over one thousand being incorporated into the three great schools of Indian Medicine, which have existed for many centuries.

Dr. Fogg invited these two gentlemen to visit the Arboretum for a year to work with him on certain problems relating to the cultivation of medicinal plants.

Dr. Varadarajan arrived in the Spring of 1956 and spent ten months at the Arboretum, studying the taxonomy and diseases of various species of drug plants and their reaction to their American environment.

His keen understanding and knowledge of Indian plants and their uses in the Indian Schools of Medicine, have been of tremendous help to the Arboretum. In return, his experiences

here have enabled him to find employment, on his return to India in 1957, with a large pharmaceutical concern, which sends him all over that vast country in search of more useful plants. He writes frequently to say that he is still homesick for the Arboretum and especially for its snow-covered hills in winter.

Mr. Rajappan arrived early in the summer of 1956, bringing with him a gift for our Library, of a fine collection of books and pamphlets on Indian Botany and Horticulture. Language is no barrier in this case, as there are several East Indian students at the University of Pennsylvania.

Mr. Rajappan also brought or sent seeds, roots, and bulbs of many plants used in Indian medicine. These have been grown and propagated at the Arboretum, greatly enhancing our valuable collection of drug plants. At the end of the year, Mr. Rajappan went to Cornell University where he is pursuing his studies for an advanced degree in Horticulture. Both of our guests have assured us that the opportunity to study American botanical and horticultural methods will be of inestimable value to them in their subsequent careers in India.

So, our Arboretum, sitting quietly on the Banks of the Wissahickon, is doing its bit towards a better understanding amongst the Nations of the World.

MARION W. RIVINUS

Arboretum Activities

(Continued from Page 2)

Dr. Patricia Allison, Pathologist, in addition to her research activities at the Arboretum, is conducting a course in General Mycology at the Department of Botany on the campus.

BONSAI MEETING

On Saturday afternoon, February 14, about 30 persons gathered at the Arboretum to witness a demonstration of bonsai methods presented by Mr. Yuji Yoshimura of Tokyo. Mr. Yoshimura is co-author of a recently published book entitled "The Japanese Art of Miniature Trees and Landscapes: Their Creation, Care and Enjoyment." Several of those who attended the meeting brought with them their own bonsai specimens and profited greatly by Mr. Yoshimura's constructive criticism of their material.

PLANT DISTRIBUTION

As previously announced in these pages, the annual distribution of plants to our Associates has been shifted from Autumn to Spring. The dates which have been set for this event are Friday and Saturday, May 22 and 23. Well in advance of these dates our associates will receive an announcement together with a list of the varieties which will be available.

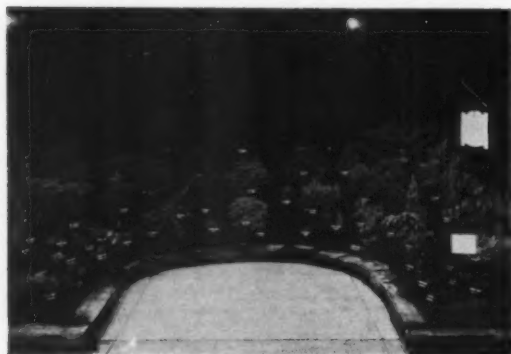


Fig. 13.



Fig. 14.

FLOWER SHOW EXHIBIT

At the invitation of the Pennsylvania Horticultural Society, the Arboretum prepared an exhibit of Dwarf and Low-growing Conifers for the Philadelphia Flower Show which was held during the week of March 9. The increasing popularity of miniature Conifers reflects not only their intrinsic attractiveness but the desire of many home owners to achieve an interesting result within a limited space. Many of the forms displayed lend themselves to effective treatment as rock garden subjects; others may be utilized in foundation plantings or as groupings on a bank or along a driveway or walk.

Several of the specimens in the exhibit were obtained from Henry Hohman's Nursery at Kingsville, Maryland, others were due to the generous cooperation of Mr. Fred Bergman of Kensington Avenue, Philadelphia, who allowed us to borrow them for the show. (Figs. 13 and 14).¹

Major credit for this exhibit must go to Miss Mary Milton, Propagator and Mr. John Tonkin, Superintendent. These two members of the staff assembled the material and worked out their arrangement in our display.

Following is a list of the material included in the exhibit:

Abies balsamea nana
Abies procera glauca prostrata
Cedrus Deodara pendula
Cedrus libani nana
Chamaecyparis Lawsoniana Forsteckensis
Chamaecyparis Lawsoniana grandis

¹Photographs by E. B. Gilchrist, Jr.

Chamaecyparis Lawsoniana minima glauca
Chamaecyparis obtusa lycopodioides
Cryptomeria japonica Jindai-sugi
Cryptomeria japonica monstrosa nana
Juniperus communis compressa
Juniperus recurva Coxii
Juniperus Shimpaku nana
Juniperus squamata
Picea Abies Clanbrasilliana
Picea Abies conica
Picea Abies cupressina
Picea Abies gracilis nana
Picea Abies Gregoryana
Picea Abies Maxwellii
Picea Abies mucronata
Picea Abies nidiformis
Picea Abies Ohlendorffii
Picea Abies procumbens
Picea Abies pygmaea
Picea Abies pumila
Picea Abies Remontii
Picea Abies repens
Picea mariana Doumettii

Picea mariana nana
Pinus Mugo rostrata
Thuja occidentalis ericoides
Thuja occidentalis Hetz's midget
Thuja occidentalis Ohlendorffii
Thuja occidentalis plicata dumosa
Thuja orientalis decussata
Thujopsis dolabrata nana
Tsuga canadensis albo-spica
Tsuga canadensis Bennet
Tsuga canadensis Bennet #10
Tsuga canadensis cinnamoma
Tsuga canadensis Curtis spreading
Tsuga canadensis Hushii
Tsuga canadensis Jervis
Tsuga canadensis Joe Gable #2
Tsuga canadensis Joe Gable #5
Tsuga canadensis Kingsville #1-B
Tsuga canadensis Lewis
Tsuga canadensis minima
Tsuga canadensis Von Helm

J. M. F., Jr.



